Ordering number : EN5473

Monolithic Linear IC



No. 5473

LA7437, 7437A

Video Signal Processing IC for VHS VCR Systems

Overview

The LA7437, 7437A is a video signal processing single-chip IC that handles the PAL-G, B and I, 4.43 NTSC, and MESECAM formats. IC internal trimming is used to make the LA7437, 7437A is completely adjustment free, and in combination with a special-purpose CCD (the LC89973M) it provides a significant reduction in external components, including the glass delay line. Thus the LA7437, 7437A can significantly reduce the signal processing board manufacturing costs. Furthermore, the LA7437, 7437A supports the NAP format (NTSC to PAL conversion) that is poised to become widespread in Europe, China and other markets.

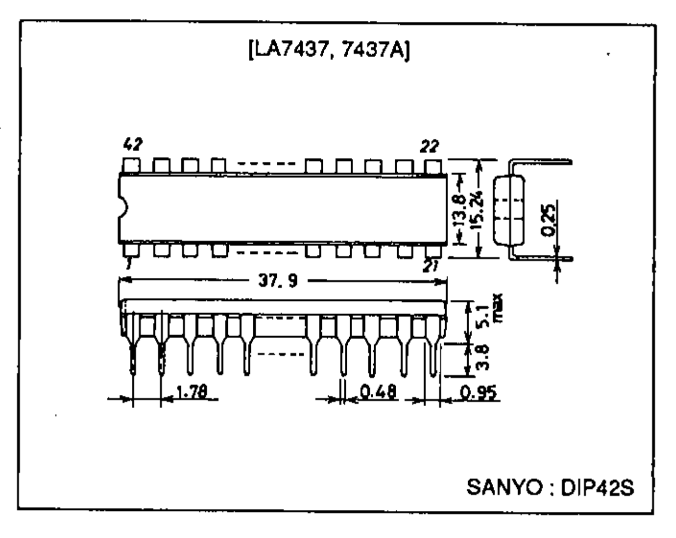
Features

- Completely adjustment free
  The AGC, carrier, deviation, and PB-Y level are adjustment free.
  The YC record current can also be made adjustment free by using the LA7437, 7437A as the head amplifier.
- Support for NAP and PAL color array correction
  Full modulation using a balanced modulator allows playback and conversion to PAL format of NTSC signals recorded on tape.
- Crosstalk exclusion in combination with a special-purpose CCD
  Crosstalk can be excluded without using a glass delay line by combining the LA7437, 7437A with a special-purpose CCD (the LC89973M).
- Minimal number of external components
  New built-in components:
  — Detail enhancer CR
  — C-trap in the Y low-pass filter
  — Playback C low-pass filter
- High performance and multiple functions
  Linear phase picture controller
  Double high-pass noise canceller, high-speed AFC, DCC
  New built-in functions
  — NAP circuit
  — AVNS (advanced vertical noise suppresor)
  — Automatic QH insertion
  — FM AGC
- Miniature package (42-pin DIP)

Package Dimensions

unit: mm

3025B-DIP42S



Functions

All VHS format VCR signal processing functions

	Luminance	Chrominance
R/P	Video amp. Feed back clamp Main LPF YNR (AVNS) VCA Sync separator 4.2 V regulator	4.43 BPF ACC amp. ACC det. Main converter 1.3 M LPF VXO/XO Side lock det. 3rd lock protector Half H killer BGP generator Killer det. VCO Phase shifter Sub converter 5.06 BPF
REC	Video AGC amp. Video AGC det. Pre LPF Detail enhancer 1/2 f_H carrier shift NL emphasis Main emphasis White/dark clip FM modulator	Pre amp. Burst emphasis (NTSC) Killer APC det. AFC det. Burst gate amp.
PB	FM AGC amp. FM AGC det. Double limiter FM demodulator Sub LPF Double high pass noise canceller QV/QH/character insert Main de-emphasis DOC Drop out det. NL de-emphasis Picture control Y/C mix	Pre amp. Burst de-emphasis (NTSC) PB amp. Killer NAP PAL burst sequence – Compensator Carrier balancer Burst gate amp. APC det. ID det. DCC Trick det. DPLL

Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max		7.0	V
Allowable power dissipation	Pd max	Ta ≤ 65°C*	1350*	mW
Operating temperature	Topr		–10 to +65	°C
Storage temperature	Tstg		–40 to +150	°C

Note: * When mounted on a 70 mm by 65 mm, 1.5 mm thickness Bakelite board. The value for the DIP package is 1150 mW.

Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V_{CC}		5.0	V
Operating supply voltage	V_{CC} op		4.8 to 5.5	V

Operating Characteristics at Ta = 25°C, V_{CC} = 5.0 V

Parameter	Symbol	Conditions	min	typ	max	Unit
[Record Mode Y System]						
Record mode current drain	I_{CCR}	Input: 1.0 Vp-p video signal	100	130	160	mA
EE output level 1	$V_{EE}1$	Input: 50 Hz system 1.0 Vp-p video signal	2.0	2.1	2.2	Vp-p
AGC characteristics 1	AGC1	Input: 50 Hz system 2.0 Vp-p video signal	2.11	2.21	2.31	Vp-p
AGC characteristics 2	AGC2	Input: 50 Hz system 0.5 Vp-p video signal	1.99	2.09	2.19	Vp-p
AGC characteristics 3	AGC3	Input: 50 Hz system with only SYNC increased 6 dB	590	660	730	mVp-p
AGC characteristics 4	AGC4	Input: 50 Hz system with only SYNC decreased 6 dB	340	380	420	mVp-p
Sync separator output level	V_{SYR}	The SYNC-OUT output pulse wave height	3.9	4.2	4.5	V
Sync separator output pulse width	PW_{SYR}	The SYNC-OUT output pulse width	3.9	4.2	4.6	µs
Sync separator output prerecord delay time	ΔT_{SYR}	The SYNC-OUT delay time	0.9	1.1	1.3	µs
Sync separator threshold level	TH_{SYR}			–20	–15	dB

Continued on next page.

Continued from preceding page.

Parameter	Symbol	Conditions	min	typ	max	Unit
[Record Mode Y System]						
Pseudo-H insertion level	ΔHD_R	With 2.7 V applied to T19A	–300	–200	–100	mV
White insertion level	ΔWH_R	With 1.3 V applied to T19A	150	300	450	mV
VCA detection voltage	V_{VCA}		2.95	3.10	3.25	V
Record YNR operation EP/LP	$V_{R\text{-}YNR1}$	Input: 50 Hz system standard color bar signal	10	12	14	mVp-p
Y-LPF frequency characteristics 1	YLPF1	The 1 MHz attenuation with respect to 500 kHz	–0.5	0.0	+0.5	dB
Y-LPF frequency characteristics 2	YLPF2	The 2 MHz attenuation with respect to 500 kHz	–1.0	0.0	+1.0	dB
Y-LPF frequency characteristics 3	YLPF3	The 3.25 MHz attenuation with respect to 500 kHz	–6	–4	–2	dB
Y-LPF frequency characteristics 4	YLPF4	The 4.43 MHz attenuation with respect to 500 kHz		–33	–25	dB
FM modulator output level	V_{FM}	No input	1.0	1.2	1.4	Vp-p
Carrier frequency 1	F_{FM1}	50 Hz system	3.7	3.8	3.9	MHz
FM modulator output 2nd harmonic distortion	H_{MOD}			–40	–35	dB
Deviation 1	DEV1	50 Hz system	0.95	1.00	1.05	MHz
FM modulator linearity	L_{MOD}		–2	0	2	%
1/2 f_H carrier shift	CS		6.5	7.8	9.1	kHz
Emphasis gain	G_{EMP}	Input: 0.5 Vp-p, 10 kHz sine wave	–0.5	0.0	0.5	dB
NL emphasis characteristics 1	G_{NLEMP1}	Input: 500 mVp-p, 2 MHz sine wave	0.5	1.4	2.3	dB
NL emphasis characteristics 2	G_{NLEMP2}	Input: 158 mVp-p, 2 MHz sine wave	2.6	3.8	5.2	dB
NL emphasis characteristics 3	G_{NLEMP3}	Input: 50 mVp-p, 2 MHz sine wave	4.9	6.4	7.9	dB
Main emphases characteristics 1	G_{ME1}	Input: 100 mVp-p, 500 kHz sine wave	4.9	5.2	5.5	dB
Main emphases characteristics 2	G_{ME2}	Input: 100 mVp-p, 2 MHz sine wave	13.1	13.6	14.1	dB
White clipping level	L_{WC}	Input: 1.0 Vp-p, white 100% video signal	176	185	194	%
Dark clipping level	L_{DC}	Input: 1.0 Vp-p, white 100% video signal	–55	–50	–45	%
[Playback Mode Y System]						
Playback mode current drain	I_{CCP}		135	160	185	mA
Dropout compensation time	T_{DOC}		0.72	0.85	0.98	ms
DOC loop gain	G_{DOC}	5H later	–1.0	0.0	+1.0	dB
Playback Y level	V_{VOUT}	For playback of an FM signal with a 1.0 MHz deviation	2.0	2.1	2.2	Vp-p
FM demodulator linearity	L_{DEM}	2, 4, 6 MHz	–3.5	0.0	+3.5	%
Demodulation sensitivity	S_{DEM}		0.43	0.48	0.53	V/MHz
Carrier leakage	CL	Input: 4 MHz, 600 mVp-p		–40	–35	dB
Playback YNR characteristics LP/EP	$G_{P\text{-}YNR1}$	Input: 50% white + CW	–2.5	–3.0	–3.5	dB
NL de-emphasis characteristics 1	G_{NLDE1}	Input: 158 mVp-p, 2 MHz sine wave	–6.0	–5.0	–4.0	dB
NL de-emphasis characteristics 2	G_{NLDE2}	Input: 50 mVp-p, 2 MHz sine wave	–10.5	–9.0	–7.5	dB
Double noise canceller characteristics 1	G_{WNC1}	Input: 158 mVp-p, 2 MHz sine wave	–1.8	–1.3	–0.8	dB
Double noise canceller characteristics 2	G_{WNC2}	Input: 50 mVp-p, 2 MHz sine wave	–6.2	–5.2	–4.2	dB
Double noise canceller characteristics 3	G_{WNC3}	Input: 15.8 mVp-p, 2 MHz sine wave	–11.7	–10.7	–8.7	dB
PIC-CTL hard response characteristics 1	G_{PH1}	Input: 50% video + sine wave f = 1 MHz, 158 mVp-p	4.0	5.0	6.0	dB
PIC-CTL hard response characteristics 2	G_{PH2}	Input: 50% video + sine wave f = 2 MHz, 158 mVp-p	6.5	7.5	8.5	dB
PIC-CTL soft response characteristics 1	G_{PS1}	Input: 50% video + sine wave f = 1 MHz, 158 mVp-p	–4.5	–3.5	–2.5	dB
PIC-CTL soft response characteristics 2	G_{PS2}	Input: 50% video + sine wave f = 2 MHz, 158 mVp-p	–9.0	–7.0	–5.0	dB
Pseudo-V insertion level (playback)	ΔVD_P	With 5 V applied to T19A	–150	–50	+50	mV
Pseudo-H insertion level (playback)	ΔHD_P	With 2.7 V applied to T19A	–300	–200	–100	mV

Continued on next page.

Continued from preceding page.

Parameter	Symbol	Conditions	min	typ	max	Unit
[Record Mode Y System]						
White insertion level (playback)	ΔWH_P	With 1.3 V applied to T14A	150	300	450	mV
Sync separator output level	V_{SYP}	The SYNC-OUT output pulse wave height	3.9	4.2	4.5	V
Sync separator output pulse width	PW_{SYP}	The SYNC-OUT output pulse width	4.2	4.5	4.8	µs
Sync separator output pre-record delay time	ΔT_{SYP}		1.4	1.6	1.8	µs
4.2 V regulator voltage	V_{REG}		4.0	4.2	4.4	V
[Record Mode Chrominance System]						
Chrominance low band conversion output burst level	$V_{OR\text{-}38}$	Input: PAL/GBI standard color bar signal, 1 Vp-p	150	190	230	mVp-p
VXO oscillator level 1	$V_{VXO\text{-}R1}$	Input: PAL/GBI standard color bar signal, 1 Vp-p	300	500	700	mVp-p
Record ACC characteristics 1	$ACC_{\text{-}R1}$	With only the chrominance signal level increased 6 dB		+0.2	+0.6	dB
Record ACC characteristics 2	$ACC_{\text{-}R2}$	With only the chrominance signal level decreased 6 dB	–0.5	–0.1		dB
ACC killer on input level	$V_{ACCK\text{-}ON}$			–26		dB
ACC killer on output level	$V_{O\text{-}ACCK}$			–60	–50	dB
ACC killer recovery input level	$V_{ACCK\text{-}OFF}$			–20		dB
VXO control sensitivity	S_{VXO}		3.8	5.7	7.6	Hz/m
APC pull-in range 1	Δf_{APC1}		350			Hz
APC pull-in range 2	Δf_{APC2}				–350	Hz
BGP delay time	t_D	Input: PAL/GBI standard color bar signal, 1 Vp-p	3.1	3.4	3.7	µs
BGP pulse width	t_W		4.7	4.9	5.1	µs
AFC pull-in range 1	Δf_{AFC1}		+1.0	+7.0		kHz
AFC pull-in range 2	Δf_{AFC2}			–3.7	–1.0	kHz
[Playback Mode Chrominance System]						
Video output burst level	$V_{OP\text{-}11}$	SP mode, input: burst 30 mVp-p	255	300	345	mVp-p
Pin 25 output burst level	$V_{OP\text{-}25}$	SP mode, input: burst 30 mVp-p	195	230	265	mVp-p
Playback ACC characteristics 1	$ACC_{\text{-}P1}$	With the chrominance level increased 6 dB		+0.5	+0.8	dB
Playback ACC characteristics 2	$ACC_{\text{-}P2}$	With the chrominance level decreased 6 dB	–0.8	–0.5		dB
Playback killer on input level	$V_{ACK\text{-}P}$		–40	–32	–25	dB
Playback killer on chrominance output level	$V_{OACK\text{-}P}$			–44	–40	dB
Main converter carrier leakage	C_{LP}	The 5.06 MHz carrier leakage component		–40	–33	dB
Burst de-emphasis level NT	G_{BD}	NTSC mode	–5.25	–5.0	–4.75	dB
Playback XO output level 1	$V_{XO\text{-}P1}$		300	450	600	mVp-p
Playback XO oscillator frequency deviation	Δf_{XO}	$\Delta fXO = f - 4.43361875$ (MHz)	–9	0	+9	Hz
SLD detector current 1	I_{SLD1}			135		µA
SLD detector current 2	I_{SLD2}			135		µA
NTSC playback burst output level	V_{BNT}	NTSC mode	255	300	345	mVp-p
NTSC to PAL conversion - V axis burst level	VB-NAP		–1.0	0.0	+1.0	dB
NTSC to PAL conversion burst level ratio	ΔB-NAP		–2.0	0.0	+2.0	dB

LA7437A Control Pin Table

<table>
<tr><th>Pin No.</th><th colspan="2">Control function</th><th colspan="2">L</th><th colspan="2">M</th><th colspan="2">H</th></tr>
<tr><td>9</td><td>R/P</td><td>Edit</td><td colspan="2"></td><td colspan="2"></td><td colspan="2">3.8 VDC or more</td></tr>
<tr><td>40</td><td>R/P</td><td>YNR (AVNS)-CTL</td><td colspan="2">1.0 VDC to less
YNR-off</td><td colspan="2">1.5 to 2.5 VDC
YNR-CTL</td><td colspan="2">3.5 VDC or more
YNR (strong)</td></tr>
<tr><td rowspan="2">11</td><td>R</td><td>******</td><td colspan="2"></td><td colspan="2"></td><td colspan="2">3.9 VDC or more</td></tr>
<tr><td>P</td><td>N, C, CTL</td><td colspan="2">1.5 VDC or less
N, C-off</td><td colspan="2">2.0 to 3.0 VDC
N, C-CTL</td><td colspan="2"></td></tr>
<tr><td>17</td><td>R/P</td><td>C-rotary</td><td colspan="3">0 to 1.9 VDC
Low CH</td><td colspan="3">2.3 VDC or more
High CH</td></tr>
<tr><td>19</td><td>P</td><td>QV/QH CHARA. INS</td><td>0.8 VDC or less
Through</td><td colspan="2">1.2 to 2.2 VDC
CHARA insert</td><td colspan="2">2.6 to 3.3 VDC
Pedestal insert</td><td>3.7 VDC or more
QV insert</td></tr>
<tr><td>25</td><td>R/P</td><td>EP/LP/SP</td><td colspan="2">1.2 VDC or less
SP</td><td colspan="2">2.0 to 2.7 VDC
LP</td><td colspan="2">3.9 VDC or more
EP</td></tr>
<tr><td>28</td><td>R</td><td>SP carrier shift stop</td><td colspan="2"></td><td colspan="2"></td><td colspan="2">3.0 VDC or more
SP carrier shift stop</td></tr>
<tr><td>27</td><td>P</td><td>NAP</td><td colspan="2">1.2 VDC or less
Through</td><td colspan="2">2.0 to 2.7 VDC
Balanced-mod output</td><td colspan="2">3.3 VDC or more
NAP-on</td></tr>
<tr><td>30</td><td>R/P</td><td>NT/MESEC/PAL</td><td colspan="2">1.2 VDC or less
PAL</td><td colspan="2">2.0 to 2.7 VDC
MESEC</td><td colspan="2">3.9 VDC or more
NTSC</td></tr>
<tr><td>33</td><td>P</td><td>Trick</td><td colspan="2"></td><td colspan="2"></td><td colspan="2">3.9 VDC or more</td></tr>
<tr><td>2</td><td>P</td><td>DOC-off</td><td colspan="2"></td><td colspan="2"></td><td colspan="2">4.1 VDC or more</td></tr>
<tr><td>6</td><td>R/P</td><td>PB-H</td><td colspan="2"></td><td colspan="2"></td><td colspan="2">4.0 VDC or more</td></tr>
</table>

Note: Do not allow pin 3 to fall under 1.5 V. (The chip will enter test mode.)

Function Control in each of the LA7437A Operating Modes

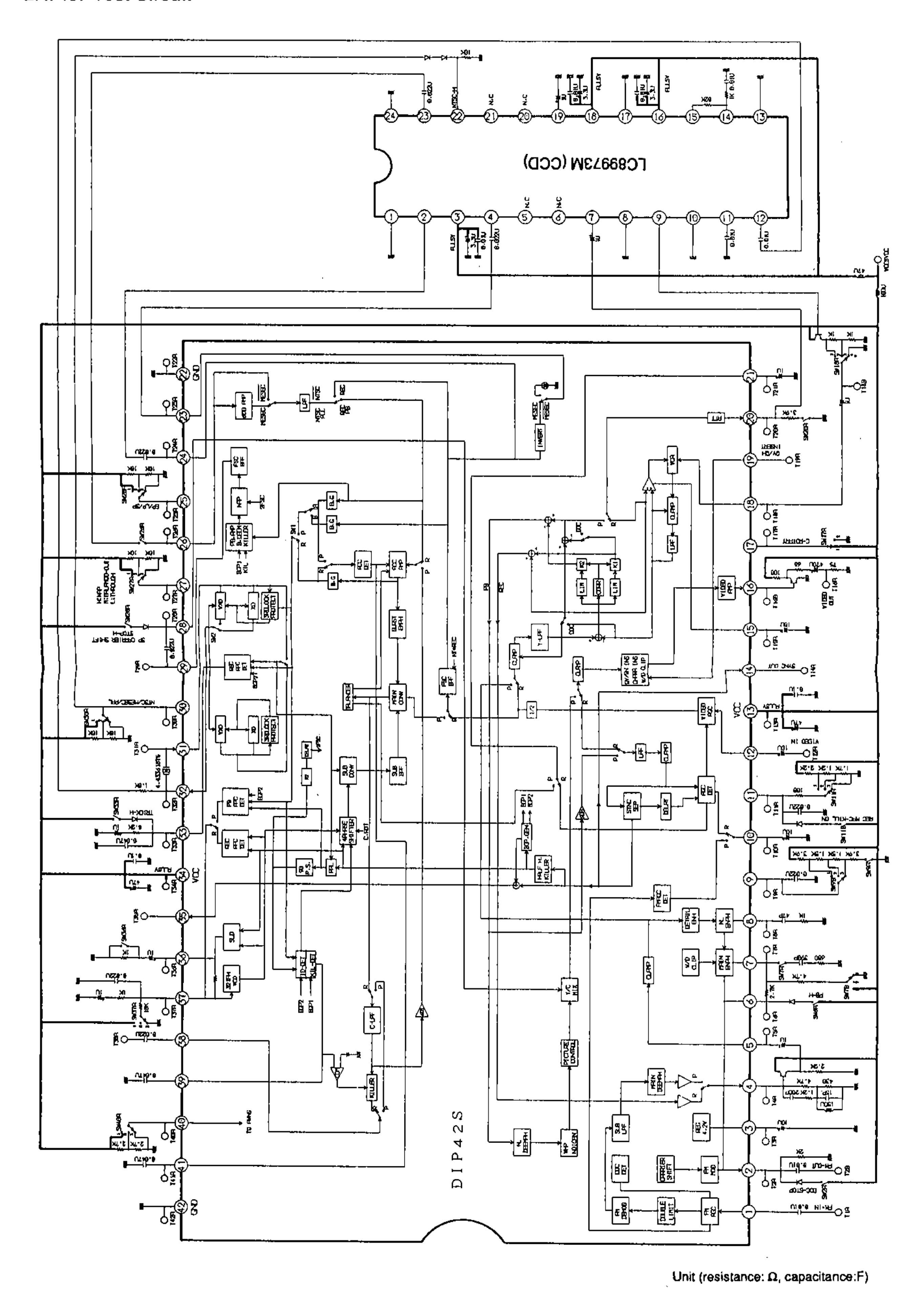
		Edit	YNR			Detail enhancer			NC			PIC-CTL	1/2 f_H carrier shift
			Pin 40 control			Pin 11 control			Pin 11 control				
			L	M	H	L	M	H	L	M	H		
REC	SP	On	Off	Off	Off	Off	Variable	Center	—	—	—	—	O (X)
		Off	Off	Off	Off	Off	Variable	Center	—	—	—	—	O (X)
	LP EP	On	Off	K1 = 0.2 K2 = 0.0	K1 = 0.2 K2 = 0.0	Off	Variable	Center	—	—	—	—	O
		Off	Off	K1 = 0.5 K2 = 0.0	K1 = 0.5 K2 = 0.0	Off	Variable	Center	—	—	—	—	O
PB	SP	On	K1 = 0.0 K2 = 0.0	K1 = 0.0 K2 = 0.0	K1 = 0.5 K2 = 0.0	—	—	—	Off	Variable	Center	Center	—
		Off	K1 = 0.0 K2 = 0.0	K1 = 0.2 K2 = 0.0	K1 = 0.5 K2 = 0.0	—	—	—	Off	Variable	Center	O	—
	LP EP	On	K1 = 0.0 K2 = 0.5	K1 = 0.2 K2 = 0.5	K1 = 0.5 K2 = 0.5	—	—	—	Off	Variable	Center	Center	—
		Off	K1 = 0.0 K2 = 0.5	K1 = 0.2 K2 = 0.5	K1 = 0.5 K2 = 0.5	—	—	—	Off	Variable	Center	O	—

Note: 1. K1 is the YNR coefficient, K2 is the LNC coefficient

2. Use the 1/2 f_H carrier shift entries in parentheses when pin 23 is high.

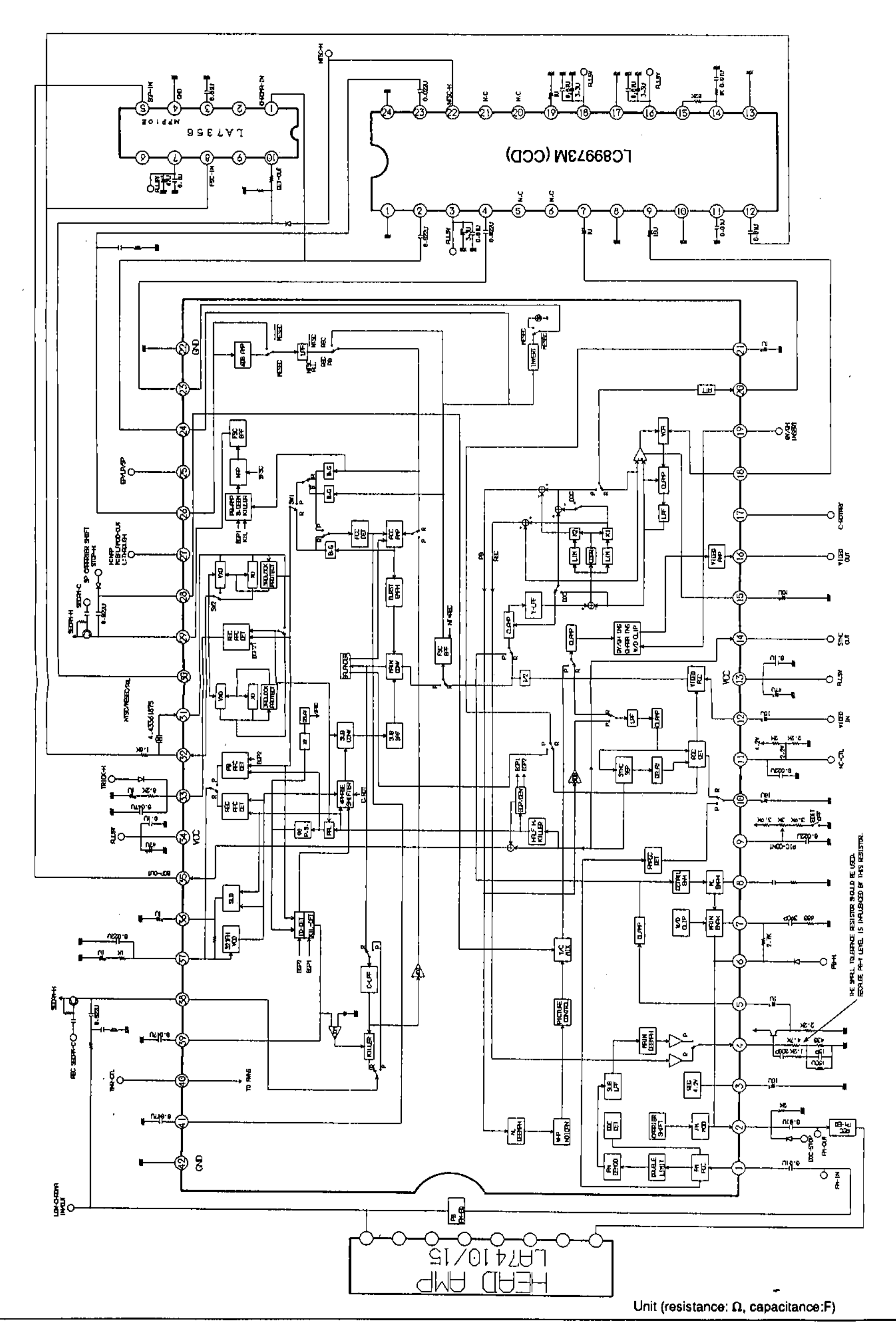
3. The detail enhancer is off when pin 18 is at the middle level.

LA7437 Test Circuit



Unit (resistance: Ω, capacitance:F)

LA7437 Block Diagram



Unit (resistance: Ω, capacitance:F)

This catalog provides information as of April, 1996. Specifications and information herein are subject to change without notice.